

community. Secondly, increasing numbers of dinoflagellates with typical biflagellate morphology are now known to have complex life cycles with stages including various cyst morphologies and colorless amoebae (Popovsky & Pfister 1990, Burkholder *et al.* 1992). Thirdly, dinoflagellates have been known to be capable of digesting and then creating chloroplasts "de novo," implying well-developed ability to utilize both autotrophic and heterotrophic modes of nutrition (Lessard & Swift 1985, Gaines & Elbrachter 1987, Hansen 1991, Lessard 1991). Among the heterotrophic dinoflagellates, some estuarine and coastal species -- with widespread occurrence in areas such as the Mediterranean Sea, the Gulf of Mexico, and the western Atlantic -- additionally have demonstrated "ambush predator" behavior (Spero 1982, Simon *et al.* 1991, Burkholder *et al.* 1992, Burkholder 1993). In each case the animal-like predatory activity has been strikingly similar: The dinoflagellates swarm up from benthic, dormant cysts when they chemically detect the presence of microalgal, protozoan, or fish prey. They devour the prey, described in one instance as being ripped apart in a "feeding frenzy" (Spero 1982) -- and then rapidly re-encyst. These "ambush" dinoflagellates include toxic representatives. Not surprisingly, all of them have been discovered following accidental contamination of established prey cultures. **We now suspect that multiple species with ambush behavior, including toxic forms, are endemic and widespread in estuarine habitat** (Burkholder *et al.* 1992, Burkholder *et al.* 1993, Steidinger *et al.* in prep.), but have been overlooked because their *detection* is extremely difficult under field conditions -- possible, in fact, only with well-timed sampling.

#### B. A Newly Discovered Toxic Dinoflagellate in the Pamlico Estuary

Among the many estuaries on the Atlantic Coast which increasingly have been associated with unexplained fish kills and ulcerative disease are the Pamlico and Neuse Estuaries in North Carolina (Noga *et al.* 1993). These systems receive high nutrient loading from sewage, agricultural drainage and, in the Pamlico, phosphate mining (Stanley 1987, 1988; Paerl 1990; Rudek *et al.* 1991). In May 1991 a "new" toxic dinoflagellate, to be formally named as *Pfiesteria piscimorte* (nov.gen., nov. sp.; Steidinger *et al.* in prep.), was discovered in the Pamlico and Neuse Estuaries (Figs. 1, 2; Burkholder *et al.* 1992). The biflagellate, toxic vegetative cells ("dinospores") emerge from benthic cysts when a substance is excreted by schools of finfish that linger to feed in the area. The dinoflagellates swim up from the sediment, excrete a potent ichthyotoxin, and consume